



# CONTRIBUTION TO QUANTIFICATION OF COMMUNICATION\*

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## ABSTRACT

Communication among humans is one of crucial human activities. Yet, its importance is not accompanied with the accurate and precise formal measure. Two starting points of this article are: (i) treating the communication among humans as a means to convene diverse individual and collective stimuli and needs; (ii) partitioning human environment into available, well-characterised communication modes, most of which makes possible mediated communication. Based on these starting points, a generic model of human communication between individuals and their environment is formulated and discussed. It is argued that there is a definite relation between the utilised communication modes and intensity of convened matter.

## KEY WORDS

communication, mediator, information, information rate

## CLASSIFICATION

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## **INTRODUCTION**

Communication is profoundly intertwined with humans, on both the individual level and the level of whole specie. In this article the emphasis is put on its formal description, in particular using the mathematical expressions for relevant quantities attributed to communication.

There are several reasons motivating such an approach. First, it can bring about more precise and more detailed description of communication, and its diverse aspects. One example of its aspects is the link between the individual communication pattern and underlying characteristics of that individual. Secondly, it can be optimised in ways ranging from education, to common practices to ergonomic elements of our artificial environment.

This article is a continuation of a series of articles devoted to formal description of human-human interactions, the communication in particular [1-3]. Here the emphasis is put onto aggregated measure of communication.

In section two basic notions are introduced and described. Section three contains description of a conceptual model of human communication presented using notions from section two. Section four summarises the article.

## **COMMUNICATION MEDIATED BY OUR ENVIRONMENT**

Communication is considered to be mediated, but in a sense which differs from the attribute mediated as it is usually encountered in the communication. Here, mediated is character is described from the systemic point of view, as utilisation of some, specifically prepared part of the environment (for a more detailed description see [1, 2]). That part of the environment includes diverse types of electromagnetic waves. Light is one of these waves the exchange of which contributes to visual communication. Then, the prepared part of environment heavily utilises air, a physical medium through which waves are transmitted making possible auditory communication, or a physical medium through which smells diffuse thus contributing also to olfactory sensing (which can contribute to communication, but more as an exception than as a regular communication mode). Furthermore, prepared environment includes other types of electromagnetic radiation, especially radio waves. Along with these, for communication qualitatively different parts of our environment are utilised in the form of objects, based on paper but including also other objects that can serve for transmitting pieces of information, eventually contributing to the communication; stones, soil, trees, etc. All these listed parts of the environment are accompanied with the complex additional objects (magnifiers, speakers, electronic devices, ...) that further contributes to communication.

The mediated communication, in this article, does not imply that there exist a person conducting a communication between two individuals, or groups, that otherwise do not communicate directly, or tends to avoid that in a too intensive way.

Overall, the notion of mediated communication here represents that considerable portion of overall communication is realised using additional parts of our environment, spontaneously present parts or specifically prepared objects, for human-human communication. It, then, excludes direct tactile communication, and various broad approaches to communication [4].

Qualitative differences in realisations of mediated communication, which originate in qualitatively different utilised parts of our environment, are in fact huge so one may ask

whether it has any substantial meaning to collect, or even unify such differences into a coherent picture. It is precisely what is further conjectured – that it is substantially meaningful.

Mediators differ in the underlying energy needed to utilise them for communication (treated here, as well as other purposes treated in more general approach), their overall inertia, recognition by humans, etc. Examples of mediators, the communication units of our environment, are found described in literature.

Before proceeding, it should be emphasised that contemporary interpretation of our environment as a sea of mediators utilisable for communication, is valid for present level of our civilisation. In ancient times and in far future, our adaptation to environment, our understanding of the environment, and finally the very environment, differs considerably.

While such an approach introduces certain set of additional notions, its fundamentals are well developed, and understood from the point of view of other disciplines [5, 6]. Art, in particular, is a human activity which encompasses considerably large number of different communication forms; differing by duration, intensity, mode of realisation etc. One can argue that it may serve as a prepared testing ground, yet with a significant portion of spontaneity and organic approach, for hypotheses stated after additional development of concept of mediated communication.

## MODEL OF MEDIATED COMMUNICATION

The aspect, up to this point implicit, which unifies all these considerably different parts of our environment, incorporates individual humans, who represent the beginning and the end of communication-related process in our environment. Certainly, different individuals introduce additional variety in the conducted communications. Yet, on the average one can assume that a significant portion of constantly conducted communications is purposeful, willing, with active contribution of involved individuals. Onto that portion of communication I concentrate here.

The aforementioned statements might look rather naïve, having in mind the profound thoroughness of otherwise reached understanding of communication. On the conceptual level such a naïve, introductory approach makes easier understanding of unification of diverse parts and processes in our environment for the communication.

Further assumption is that humans can form, create or utilise otherwise existing mediator, with a rather precisely determined characteristics, so that a specific, temporary important contribution to the communication process, can be conducted. Naturally, being a process, such an endeavour cannot be conducted with maximal admissible efficiency, so some residual uncertainty (i.e. ambiguity in communication) must be assumed.

Another look on the previous text brings about its interpretation in the constant removal of any, almost all of the characteristics that differentiate mediators. Let us assume that we continue with that removal and find the essence, the kernel of a mediator.

It is conjectured here that the essence of mediators from the point of view of its utilisation for communication, is their **capacity**. Similarly, from the point of view of individual humans utilising them for a communication, mediators are characterised (and mutually differentiated) by their capacity. Here, capacity is the maximal set of characteristics (knowledge, emotions, ...) attributed to an individual, that can be **conveyed** in a given time interval. Naturally, additional parameters are attributable to that, e.g. durability of such a transfer: individual human thoughts, emotions and other characteristics, can be transferred either rapidly and temporary, or in a rather durable and resistant way, with a dense

gradation of existing durability. Before proceeding let me emphasise two underlying implications and/or restrictions of the formulated approach at this level of precision. First, this is an averaged approach, so some individuals have characteristics that prevent their use of some of the otherwise utilisable mediators. That can be because of the lack of knowledge related to these mediators, or because of the individual physical and psychical characteristics. Secondly, the society has awareness and accepts mediators, a fact that changes during time, and will probably continue to change gradually.

In the context of individuals willing to communicate (thus to participate in a non-materially realised exchange), with a sufficient level of knowledge of available modes of conveying the communication, the mediators exploited in a given time unit correspond to the individual characteristics (desire, will etc.) to participate in the exchange bringing about the communication.

It is conjectured here that the stated correspondence means that larger desire for communication brings about the use of mediators with larger capacity. Additionally, it is conjectured that during the communication, involved individuals change or try to change, the utilised mediators so that they follow the changes in the individuals' characteristics. In that sense, changes of willingness or desire for communication brings about the corresponding changes or tendencies for change in the utilised mediators. First conjecture denotes a particular state, independently of its duration. It can be considered as a conjecture about the communication stationarity. Second conjecture treats changes in the communication so can be considered as a conjecture about the communication dynamics. Duration of an interval, during which the significant changes in communication pattern are observed, here is not specified. On the one hand, extreme of a short change, it is a small part of a single event of communication, while on the other hand it may span through several, time-separated events of communication.

## CONCLUSION

Mediated character of communication can serve as a general concept, valid for the majority of the types of communication. Initial considerations of that concept resulted in two conjectures, that can be further developed into hypotheses and correspondingly tested. One is conjecture about the relation between the communicating individuals and the set of utilised mediators. The other relates changes in characteristics of communicating individuals with the changes in the currently utilised mediators.

In the text, for clarity it was assumed that two individuals communicate. There are individuals for which some of the stated assumptions are not valid. Along with that, there are collectives, institutions etc. for which the stated assumptions are valid.

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